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CONTENTS.

SUMMARY:—
Our Soldiers' Monuments. — The Architecture of the Boston Memorial. — Our Illustrations. — Fall of a Crowded Temporary Staging. — The Late Fire in New York — and what Good may come of it. — The Annual Convention of the A. I. A. — English News 301
THE DOME OF ST. PETER'S 303
THE TEMPLE OF JUPITER AT SELINUS 303
THE ILLUSTRATIONS:—
French Memorial Designs. — Soldiers' and Sailors' Monument, Boston. — The Dome of St. Peter's. — Country House, 305
DECIMALIZING BRITISH MEASURES 305
CORRESPONDENCE:—
Letter from Philadelphia 306
COMMUNICATION:—
Lighting by Electricity 306
CIRCULATION OF HOT WATER IN BUILDINGS 307
NOTES AND CLIPPINGS 307

IN innumerable towns and cities throughout the country the feeling of gratitude towards the soldiers and sailors by whom during the war of the Rebellion the Union was re-established and slavery abolished, has naturally taken form in memorial structures of various device, among which that dedicated on Monday last, on Boston Common, is doubtless one of the most conspicuous. In our leading article of Aug. 18 we made some remarks concerning monuments in general and the peculiar difficulties surrounding the designing of them; but the sentiment which has prompted the erection of our monuments of the war is of such a nature that criticism in regard to their artistic merits or demerits is, to a certain extent, disarmed. We too would hesitate to "peep and botanize upon our mother's grave;" but as these structures are monuments not only of our piety and patriotism, but of our national attainments in the highest department of art, it seems not unbecoming for a journal of this character to take advantage of the opportunity offered in the completion of the Boston Memorial, to say a few serious words as to the results of all these efforts to express by form sentiments so noble and tender. The opportunity has been great; how has it been used? To say that, in the great majority of cases, the expression has been unworthy of the thought, is simply to admit that we are not as yet an artistic people, that the resources of art are not yet at our command, or if at our command, that they have not been appreciated and used. Our errors, whatever they are, may be attributed to ignorance and not to indifference; and that our ignorance is due not to any natural incapacity of perception is apparent from the fact that the poverty or baldness of design in these memorials is exhibited, not so much in bad sculpture, — for some of it is excellent, — as in its unskilful union with crude architectural forms. A mass of costly stonework, carefully cut, put together with the best mechanical skill and precision, set up in a public place, having no practical use whatsoever except the ostentatious performance of its constructive duty to uphold a statue or to contain an inscription, or to convey a concrete sentiment to the mind by means of military, naval, or civic devices, must have a separate and essential beauty of its own; a beauty of fitness, obtained by extreme refinement of proportion, choice of detail, propriety of outline, so carefully considered and chastened that it must feel the variation of the fraction of an inch in any of its dimensions. Until by study it has been exalted to this condition of sensitiveness, it has no right to exist as a monument or as a part of a monument; it is not a work of art, it is a work of stone-cutting; and to lavish upon such a block a profusion of emblems, or to surround it with statues, will not raise it in the scale of art. It need scarcely be said that few, if any, of our monuments will bear this test. We can diminish the width or increase the height of any of their parts without loss or gain of effect. They have not been vitalized by the study of a practised artist; they are crude in expression; and if the author has ventured with his blocks to repeat the language of a style, in nine cases out of ten we find the style has been misunderstood and misused.

THE Boston monument to her soldiers and sailors offers itself to us as one of the best of its kind. As a work of architecture as well as of sculpture, it is attributed to Mr. Martin Milmore, a sculptor whom we recognize as an artist of unusual merit. The elements of his composition are simple enough: a colossal figure upon a Doric column supported by a pedestal with a cornice, a panelled die, and a plinth; under this a comparatively low sub-base or plinth, with projecting blocks at the four angles, each bearing a typical figure, and the whole united with the ground by three steps. This architectural composition is not offensive, its proportions are according to the books; one cannot object to its simple mouldings; but it sins in this respect, — it is *commonplace*. Considering the function of this piece of architecture, this is the unpardonable sin; there is no attempt made to adapt the order to this especial use, no touch of grace or poetic feeling, none of that invention and courage which compel the formality of the order to yield its cold virtue of correctness. The division of the shaft by sculptured bands into four equal or apparently equal parts, the arbitrary selection of one of these parts for the enrichment of fluting, the interruption of the base of the column by four blocks supporting figures in high relief against the lower drum of the shaft, — these expedients are bold indeed, but they are crude and (to speak after the manner of architects) illiterate. No architecture can submit to equal divisions in height without becoming mechanical; and the four blocks at the base of the shaft render necessary a bold variation from the usual base of the column in this order; but the variation attempted in the use of the Attic base is insufficient and timid. The four figures planted on the angle buttresses of the plinth are very unhappily placed. From diagonal points of view three of those statues are presented; the two outer so detached by wide intervals from the monument as to destroy the unity of the composition, the middle one so set against a sharp angle as a background that all its lines suffer from the harsh contrast of light and shade against which it is projected. From every accidental point of sight the monument *sprawls* at its base. It is neither compact nor pyramidal in effect. It is perhaps in the placing of the statues that this composition seems most to need the study of the architect. These figures are too good in modelling to be so inartistically disposed. They are simply sacrificed. It is also a matter of regret that the original intention of the design was altered in respect to the material of the statues. These are of bronze, and the two materials, bronze and granite, cannot be combined with success. They are essentially antagonistic in color, and an effect of unity cannot be obtained with any such combination unless one or the other material is much more subordinated than in this composition. Among the minor sins of commission in this design, we may mention the eagles above the abacus of the shaft; they are weak and misplaced. We shall doubtless be referred to the monumental columns of Rome as prototypes of this in respect to many of the points which we have noted, but the comparison cannot be maintained for a moment. They are the works of masters in architecture: this is the work of an amateur.

WE have discussed this design purely as a work of architecture, and we hope with all the respect and moderation which such a subject demands. If we find the monument itself indicative of a prevailing want of sensitiveness as regards matters of art, the silence of criticism would be a still more evident proof. We present herewith a sketch of the Boston monument, and, for the sake of such instruction and interest as may be afforded by the comparison, reproductions of several monumental studies published by the "Intime Club," a society of students of architecture in the *École des Beaux-Arts*, at Paris. As the work of students as well as of masters, they give a fair picture of what is done in an atmosphere of art even by unpractised hands. The freedom and poetic character of these designs is based of course upon an absolute knowledge of the orders, which are the grammar of architecture. Their failures are in the direction of assurance, and superabundance of strength. Our failures in works of a similar character are attributable, not to timidity indeed, but to a want of training in the "low beginnings" of archi-

tecture. Until our students shall have had the opportunity to make the public familiar with good things, the public will remain content with poor ones.

THE dedication of the Soldiers' Monument in Boston, on the 17th inst., was marked by one unhappy accident. There were several stagings erected by the city, on the route of the procession, for the accommodation of spectators; also one around the monument itself. These structures were examined by order of the Inspector of Buildings; and we learn that the staging around the monument, which was visited by the inspector himself, was strengthened on his requisition. Those erected on Blackstone Square however, which were visited by his subordinates, proved insufficient through want of longitudinal bracing, and one of them fell in the direction of its length, carrying with it a crowd of occupants, many of whom were seriously injured. Until the report of the official inquiry is received, it is proper to withhold an expression of opinion as to the responsibility of the accident. But wherever the blame is to rest, the criminal carelessness of the structure cannot be doubted; and if the inspectors permitted the occupation of such a structure after examining it, they should find it hard to escape the consequences of their oversight. This is to be added to that accumulating list of experiences by which the lesson is enforced that the price of security is unceasing vigilance. We have had occasion of late to approve the record of the chief inspector, and sincerely trust that in this matter his action may be found consistent with our statements.

ACCORDING to the evidence before the coroner's jury in the case of the deaths occasioned by the burning of J. P. Hale's piano-forte factory on West Thirty-fifth Street, New York City, Sept. 3, the building had walls 20 inches thick to the second story, 16 inches thick to the third story, and above that 12 inches; but the new portion had its walls 24 inches thick to the second story, 20 inches thick to the fifth story, and 16 inches to the top. The authorities of the Department of Buildings testified that the structure was in accordance with law; evidence was also given that in the depth of 200 feet there were two staircases extending the whole height of the building, and two chain or ladder fire escapes outside on each side of the building; that on the fifth floor there were several hogsheads of water, and pails of water were placed in several stories for the extinguishing of fires. The verdict of the inquest, however, includes a censure of the owner of the building, on account of his neglect to provide adequate means for the extinguishing of fires, and recommends that the proper authorities compel the owners of such buildings to provide in each case a tank or tanks filled with water and placed at the top of the building, with standing pipes from the same with a hose attached on each floor; and that all drying-rooms be built strictly fire-proof; and that the commissioners of public works cause larger mains to be provided in such localities. The destruction of this factory, furnished, as it appears to have been, with all the appliances for safety required by law, if the opportunity is properly used, cannot fail to mark another step towards a more civilized method of building. "Out of this nettle danger, we pluck this flower safety."

FIRE MARSHAL SHELDON'S recommendation that all factories should be supplied with water-tanks having proper standing pipes and hose connection, is admirable; but the recommendation should be accompanied by some provision of the law contrived to compel occupants of such structures to have a periodical fire-drill of their workmen in connection with these appliances. Without some such drill the most admirable contrivances become inoperative in the moment of danger. The importance of the proposition made by the superintendent of buildings to require all drying-rooms to be made fire-proof is so self-evident, that the necessity of making the proposition accuses the present building laws of the city of New York of a very culpable omission in this respect. A proper step towards the necessary amendments to the law was proposed on the 13th inst. in the Board of Aldermen by Mr. Alderman Morris, who offered a resolution for the appointment of a board of ten experts composed of three carpenters, three masons, two iron-builders, one civil engineer, and one architect, who shall make a general review of the law, especially guided by the experience gained in this latest disaster, shall examine the present administrators of the law to ascertain if they are competent, and shall advise with the Corporation Counsel in the preparation of an amended law to be sent to the next legislature for enactment. Now is the opportunity for the New York Chapter of the American Institute of Architects once more to make its influence felt, and in this movement to contribute its due share of intelligence and experience, which, by the by, seem to be rather insufficiently recognized in the resolution mentioned above. There should be no rest so long as the iron is hot.

AT the Annual Convention of the American Institute of Architects to be held in Boston next month, there are to be two stated subjects of discussion, the one on Religious Architecture, having especial regard to the proper effect of modern necessities and requirements on consecrated forms, and the other on Fire-Proof Building, including mainly a consideration of the methods by which floors and roofs may be rendered uninflammable. If the best experience of members of the Institute is brought to bear upon these discussions, they cannot fail to be in the highest degree instructive and useful. The opportunities offered by such occasions as that of the Convention of the Social Science Association at Saratoga on the 6th and 7th inst., and as will be presented at the Annual Convention of the architects in Boston next month, are a necessary part of the machinery of progress. They enable us to make the best use of experience, to compare notes with those engaged in studies similar to our own, and encourage and renew us for fresh efforts. As regards the former Convention, we shall be able in our next issues to print one or more papers on architectural subjects there presented, together, we hope, with a general statement of the discussions on sanitary building.

OUR English professional exchanges bear the usual marks of the annual metropolitan dulness occasioned by the season. The *Builder* has an excellent leader on the genius of Rubens, recalled by the late fête at Antwerp in his honor; and a report on the progress of the German restoration of Strasburg Cathedral, which includes the placing of fourteen new colossal statues of emperors and kings on the exterior, most of them equestrian. The article of principal interest in the *Architect* is a report of the examination of Sir Gilbert Scott by a parliamentary committee, with regard to the style and alleged deficiencies of the Foreign, Home, and Colonial Offices erected from his designs at Westminster. In this examination, the distinguished architect attempts to show the sacrifices of accommodation which he was compelled to make when directed by Lord Palmerston to change the style of these buildings from Gothic to Renaissance. He compares the cost and convenience of these buildings with those of the banqueting hall of Inigo Jones, and the Somerset House of Sir William Chambers; and explains how Gothic work admits of a larger window area than Renaissance. His views were elicited under a sharp fire of questions by such men as Mr. Beresford Hope, Sir George Bowyer, Sir William Fraser, and others; and the whole presents, in very entertaining contrast, the views of intelligent laymen and of a distinguished architect upon questions of style and its relations to the economy of building. The *Building News* gives several interesting plates of drawings illustrating Ford's Hospital, a famous timber building erected in Coventry in 1529. The window tracery is of thin wood perforated, and the glazing behind is square. The timber-framing is only four inches thick, filled in solid with plaster finished flush on both sides. The whole of the external timber-work is coated every two or three years with boiled oil. The details and profiles of the mouldings are unusual and very good. This building might furnish many curious *motifs* for our own wooden architecture.

THE State Department has preserved such information relative to the old bench-mark of Jefferson's Meridian stone, which was removed by Gen. Babcock under the Board of Public Works, that it will now be possible for the engineers to fix the actual amount of settlement of the Washington Monument.

THE DOME OF ST. PETER'S.

THE fear of insecurity which has always waited on the dome of St. Peter's has recently become once more a serious matter. Most persons remember what dangers menaced it from its infancy in spite of Michael Angelo's care for its stability, as well as the precautions which were taken to secure it, and which have thus far sustained it. The iron girdle which was added to the armatures that Michael Angelo had provided, and which checked the first spreading of the dome, has not been enough to secure the structure altogether from further injury. The cupola has been carefully watched, and indications of further settlement and dislocation noted, which of late have become serious enough to excite anxiety.

Settlement and cracking of the masonry, accelerated by the introduction of openings which were not intended by Michael Angelo, have continued, and have been aggravated to a dangerous degree, it is said, since the bombardment by the French in 1849. The threatening condition of the dome has roused the interest of the Russian Academy of Fine Arts; and not long ago, at its solicitation, the Russian government sent a commission, which, by the favor of the authorities at Rome, has made a thorough examination of the deterioration. In a recent number of our Russian contemporary, the *Zodtchy*, we find a very interesting account of the examination from the chief of the commission, whose name unfortunately is omitted from the paper. The report is too interesting not to be laid before our readers; but in order to make it more intelligible, it will be worth while to defer the account of the present condition of the cupola till we have recalled the chief points in its construction. The great cupola consists, as is usual, of four parts, — the ring which rests on the foundations forming the base of the structure, and is treated on the exterior as a stylobate; the drum or tambour pierced by sixteen large windows, with columnar buttresses between; the dome itself with its supporting attic; and the lantern. The ring, measured from the soffit of the great arches at the crown, is about forty-three feet high by thirty feet thick, and is pierced by an annular vaulted corridor six feet wide, which, making the circuit of the cupola, is lighted by four small windows, within and without, at the cardinal points of the church. In every fourth buttress a spiral stair leads up from this corridor to the space between the two shells of the vault. The drum, to which is applied the principal order (Corinthian) on the outside and inside, is fifteen mètres high (say forty-nine feet) to the top of the order. Its wall, of about ten feet thick, is re-enforced by the buttresses between the windows to the full thickness of the ring below. The buttresses consist of a return wall, set against the middle of each pier, flanked by two columns which are attached to its exterior angles, the entablature of the order being broken around the whole. Arched openings in the wall of every buttress give a passage round the drum on the cap of the stylobate. The attic, which surmounts the order of the drum and carries the dome, is about eighteen feet high and is solid. The form of the lantern is familiar, and there is nothing specially remarkable in its structure. The small dome with which it is covered, which does not show from without, is levelled up in the haunches to a flat floor, and on this rests the hollow conoid of masonry that supports the ball and the cross. The whole is stayed to the dome with iron rods.

The construction of the great dome is unique. It consists of two shells of masonry, of which the inner is the thicker, the outer one being covered with lead. They unite for some thirty feet above the attic in a solid zone, above which they gradually separate, the outer shell having a steeper rise than the inner, till they are about ten feet apart. The outer curve of the dome, which is very noble, is found not to coincide with any of the curves of the second order, and it is thought that it must have been described by hand. M. Garnier, by the way, in his article in the *Gazette des Beaux-Arts* of last year, in which he attracted so much attention by attacking the fame of Michael Angelo as an architect, asserted that this curve, supplied by another hand than Michael Angelo's, was the only fine thing in the dome, and drew therefore the inference that Michael Angelo's design in his great church had been vastly overrated. The two shells abut at the crown upon a ring which again unites them, and on which the lantern rests. It has an opening of about twenty-five feet. This ring, like the stylobate below, contains an annular corridor, with a series of windows (sixteen) looking into the interior of the cupola. The two shells are united furthermore by sixteen great meridian arcs, or vertical webs, as it were, one over each buttress. These meridian arcs, or webs, are about eight feet broad at the base, where the interval between the shells of the dome is only three feet or so, and the whole thickness some eleven feet. At the top, where the shells are ten feet apart, the webs have tapered to three feet. The sixteen cellular spaces between them are nearly twenty feet broad at the base, and diminish to five at the top. Three tiers of dormers light them; archways through the bottoms of the dividing webs unite them; and one may walk round at the base between the shells in a continuous corridor a yard wide, to which the spiral staircases in four of the buttresses conduct him. The extrados of the inner shell is notched in courses so that each cell forms a staircase, up which the visitor may climb to the corridor which pierces the ring at the base of the lantern.

The meridian arcs may be said to penetrate the two shells, projecting above and below, in visible raised ribs. They are, in fact, the principal supporting members of the dome, and act like flying buttresses, transmitting the weight of the lantern and thrust of the whole structure directly to the buttresses below on which they rest, while the surfaces of the dome may be regarded as a series of vaulting cells filling the spaces between them. They are, indeed, whether they came first in the architect's mind or not, the real skeleton of the construction, which is therefore more Gothic than classic, and actually consists of a lantern supported on sixteen huge flying buttresses that are connected and steadied at their extrados and intrados by the shells of the dome, but capable of standing and supporting the lantern, or at any rate of being made to do it, if these shells were removed. It is, in fact, an instance on an enormous scale of the kind of structure of which the crowns that sometimes surmount Scotch towers are a type, and of which the belfry of St. Nicholas at Newcastle upon Tyne is the most famous acknowledged example, — a lantern lifted on flying buttresses, — with the difference that here the vaulting cells that connect the buttresses are supplied, while there they are omitted. Acknowledged example, we say; the distinction being one of architectural treatment, — at Newcastle the buttresses are displayed as conspicuously as possible, at Rome the chief importance is given to the domical shell with which they are overlaid. In the Gothic example they are acknowledged and vaunted; in the Renaissance they are hidden. The principle of the construction then is not, after all, that of the classic dome, — for instance, that of the Pantheon, to which tradition points as Michael Angelo's model, in which the pressure is uniformly transmitted and distributed over the ring at its base; but truly that of the mediæval vault, where the stress is collected by ribs, and concentrated into a few points where it is met by buttressing. In this respect it is more nearly mediæval than Brunelleschi's dome, where the ribs are too few and probably too slight for such an office, although they are more conspicuous in the exterior design, and would be better buttressed by the solid angles of the octagon. Michael Angelo's treatment naturally required the boldest buttressing at the points where he had concentrated his thrusts, or else very careful tying. As we know, his buttressing proved insufficient; indeed, it is difficult to see how any treatment of it compatible with the style in which he worked could have been quite sufficient. Such an example will make the architect hesitate to accept Mr. Fergusson's dictum that it is almost as difficult to build a dome that will fall as a vault that will stand. The greater caution of Sir Christopher Wren saved his construction at the expense of his architecture; but at St. Peter's, even the tying which has been added at different times has not saved the work from a steady deterioration that now points, we are told, to future ruin.

THE TEMPLE OF JUPITER AT SELINUS.

BEFORE all, in order to conceive a just idea of its grandeur, we will cite its principal dimensions, comparing them with those of a well-known monument which is properly regarded as the largest temple of modern times, — a Grecian temple, although the order is Corinthian and the proportions Roman. These comparisons have been made by M. Hittorff.

The temple at Selinus is 50 mètres (162′) in width: the Madeleine at Paris measures only 41 mètres (133′). On the long sides, the temple at Selinus measures 110 mètres, 30 c. m. (358½′); the Madeleine measures only 92 mètres (299′): so that the Made-

leine covers only 3,722 sq. mètres (40,048 sq. ft.), while the temple at Selinus covers 5,500 sq. mètres (59,180 sq. ft.) The diameter of the columns at the base is 3 mètres, 41 c. m., or more than 10 feet: the diameter of the columns of the Madeleine is only 2 mètres, 10 c. m., or nearly two-fifths shorter. The height of the columns with the entablature is 23 mètres, 60 c. m. (76′ 9″), at Selinus; while the Madeleine measures 23 mètres (74′ 9″). With the entablature complete, the temple at Selinus measured 31 mètres (100′ 9″); with its lofty pediment, the Madeleine measures only 32 mètres (104′). But it is necessary to keep in mind that the proportions of the Doric order allow only four diameters and two-thirds to be given to the columns; while the columns of the Madeleine have nearly eleven times their diameter in height.

I could also compare the temple at Selinus with the temple of Jupiter Olympius at Agrigentum, and could show that it was larger than the Temple of the Giants.

The plan of the temple shows eight columns on the façade, and seventeen on the sides. It is the plan of the Parthenon, but how much larger is the temple at Selinus than the Parthenon!

The first glance at the plan shows us the same system as that adopted in the three other temples, — system peculiar to the architects of Selinus, and which is probably nothing else than the compromise between the needs of religion and those of every-day life. In the monuments of the following century, this confusion is no longer found.

The peristyle is widely separated from the cella; this space is so great, that Wilkins, an English architect, has been led to suppose that there were two ranks of columns; what I have said in a former article will explain this error, and the object of the architects. The peristyle was intended for the crowd: the proof is, that all along the façade not only the high steps of the stylobate are found with small steps equal to the central inter-columniation interpolated, but real steps are built before the whole breadth of the façade; these steps are eleven inches high. If we enter into the cella from the peristyle which surrounds the temple, we find it, too, arranged to receive a crowd; in fact, not only the central door exists, but it is flanked by two other doors to which correspond two doors in the wall of the rear portico, which is called the posticum. This is the arrangement of the interior, — the sanctuary backed against the separating wall, which is built very thick in order to support the weight and play of the doors; the portico of ten columns on each side in front of the sanctuary in which was the statue of the god; in the middle the court, the hypethra, an uncovered space; under the porticos the direct passage for the crowd which traversed the temple from door to door. Thus in this vast temple every thing is for the people, for circulation; the god has no real sanctuary except the most remote portion of the cella about twenty feet wide, surrounded by walls.

Thus is completed the system in which the plans of the ancient temples of Selinus have been conceived. The crowd, or at least the visitors, are admitted to the interior, and circulate from door to door under the porticos as by an alley-way. On the outside, the peristyle offers a shelter to the citizens for their public meetings; it is the *agora*, it is perhaps the market, for one cannot help thinking of the well-known passage in the New Testament which represents Jesus as chasing the money-changers from the temple. The temple at Jerusalem was a sanctuary less open than any of the temples of antiquity. Had the money-changers then penetrated into the sanctuary, into the Holy of Holies? It seems as if they must have kept themselves merely under the porticos; and to Christ's eyes, as to the eyes of a modern, that was already a profanation. The Greeks came to this conclusion later, and at Selinus they made the temples of the succeeding century inaccessible.

If from the plan we pass to the elevation of the monument, if we examine not only its disposition but its construction and its style, we recognize that it belongs to two distinct epochs, and that it presents, because of this double character, a remarkable example of the spirit of Grecian art, of its logical progress, and of its inflexible traditions.

The temple of Jupiter Olympius was never completed; this is what made Wilkins suppose that an intermediate row of columns must be added and a double colonnade established about the temple. The reason, in his opinion, was the difficulty of covering the portico with stones, with beams formed of a single stone which must be supported at the same time by the colonnade and by the wall, for these would have had to be about 11 mètres (36′) long. He believed that intermediate supports were necessary, but we shall see in an instant what immense blocks the inhabitants of Selinus knew how to extract from their quarries situated near the river Selinus. The Egyptians knew how to push still farther the employment of monoliths. Here at Paris even, do we not see the raking cornices of the pediment of the Louvre, the pediment which surmounts the façade built by Perrault, formed by two stones each more than 50 feet in length? Perrault had these two monoliths extracted from the quarries at Meudon; they have since then split in different places.

The temple then was not completed. The columns are lying on the ground, with their capitals thrown by the efforts of machines a little farther than themselves. Some are fluted, others have only a beginning of flutings; the rest are still left in the rough. They have not yet emerged from their shroud of stone; for the ancients used to do exactly what we do to-day: they blocked out the columns and capitals, and constructed the building. The sculpturing of the stone began only after the upper portions were finished, and always while lowering the scaffolding, from fear that inevitable accidents might destroy the mouldings and the sharp arrises of the lower portions of the buildings if they were sculptured first. The temples of Segestum, of Delos, and the Parthenon at Athens, present the same peculiarities. Now, not only the temple had not been finished, but the works had been abandoned in the time of Pisistratus, then recommenced in the time of Pericles, then again interrupted by public misfortunes, by the wars, so that the temple was overthrown by the Carthaginians before it was completed. Thus one must not look for sculptures in the pediment, nor sculptures upon the metopes, nor colors upon the mouldings. The columns of the principal façade, that is, of the eastern façade, and the columns upon the sides, have flattened capitals, while they themselves are excessively attenuated towards the top. This is the archaic style, the style of the times of Pisistratus. On the other hand, the rear façade, the one facing west, has columns whose shafts are diminished with much precaution; consequently the column has more force, more thickness, and its capital holds up its head with a line firm, decided, architectural, which belongs to the best epoch, to the age of Pericles. This is a remarkable fact, and shows in a striking manner what was the tradition of Grecian architecture. Nowadays what do we do when we finish a building? We continue the style, whatever may be its epoch, whether it be Gothic or Renaissance, whether it be good or bad; preferring a homogeneous monument full of unity to corrections, to innovations, which, excellent in themselves, take from the building its character and its unity. What do we see at Selinus? A temple which remains for a long time half built. Money fails; the sacrifices have already been considerable; revolutions, wars have intervened: the works are stopped. But during this time, art progresses in Sicily as well as in Greece, in the colonies as well as in the metropolis. Fifty years, sixty years, a century perhaps, have elapsed; emulation, the example of Agrigentum, a neighboring city, a rival, which constructs its temple of Jupiter Olympius after the defeat of the Persians and Carthaginians, provoke a new effort. Selinus recommences its work. What does the new architect? He follows the mode of the time: he follows tradition, — inflexible tradition. He can change nothing in the plan, nor in the proportions; the diameter of the columns, their height, — every thing is given; he must accept all. But he can change the profile of the capitals, the contour of the columns, and by this alone give them a totally different aspect. This is what he does, and without heed to the past, he gives to his capitals a pure, decided curve; he increases the thickness of the columns at their summit, at the necking, underneath the capital; he increases it by 55 centimètres. What was the effect of these two façades so different? We cannot tell; but it must be kept in mind that the effect was perhaps completely saved, because two opposite façades of a rectangle can neither be seen nor compared at the same time. It is even possible that at a height of fifty feet, — for the columns are 16 mètres, 60 c. m., high, — one could not distinguish the contour of their capitals without the closest attention; and, by reason of the perspective, the diminution of the columns, on this side very pronounced, on the other side very slight, could only be detected by skilled observers. Nothing is more fit to show how little the Greeks cared for erudition in matters of art, or, if you wish, for unity of style. They followed progress, and conformed themselves to tradition. The architect who continued the temple did still more: he changed every thing in the plan that he could. Thus the antæ or pilasters of the pronaos were originally in line with the columns; he brought them forward so as to unmask them, and by so doing conformed himself to the progress denoted by the Theseum, the Parthenon, and the noble temples of the fifth century. Moreover, on the older façade the capitals of the antæ have a form which is primitive and confused; they are two inverted volutes with a palm, — a singular mixture of Ionic elements with the Doric order, — a souvenir of the time when perhaps the two orders were not clearly distinguished. On the other hand, the capitals of the antæ of the more recent façade are conformed to the classic traditions of the best epoch; they present the crow's-beak moulding. But the difference of the two pilasters at the opposite ends of a temple was not a serious thing, and counted among the details. These disparities, dictated by a respect for tradition, must not be compared with the horrible adjustments of the eighteenth century, which used to plaster façades in its own style upon Gothic churches or Roman basilicas.

The epoch of the first foundation of the temple is unknown to us like all the rest of the history of Selinus. If we examine the scale of proportions, we see that the columns are 3 mètres, 41 c. m., in diameter, while they are 16 mètres, 60 c. m., in height, consequently the proportion is four and two-thirds diameters: that is a little greater than temple D in the acropolis of Selinus, which is four diameters and a half, while it is a little less than temple F, which counts five diameters. The construction of the temple of Jupiter should then be placed between the epochs of the construction of these two temples; but since these are unknown, any other than a relative classification must be renounced: hence the temple

A MONUMENT TO MUSIC

M. HOYEAU.

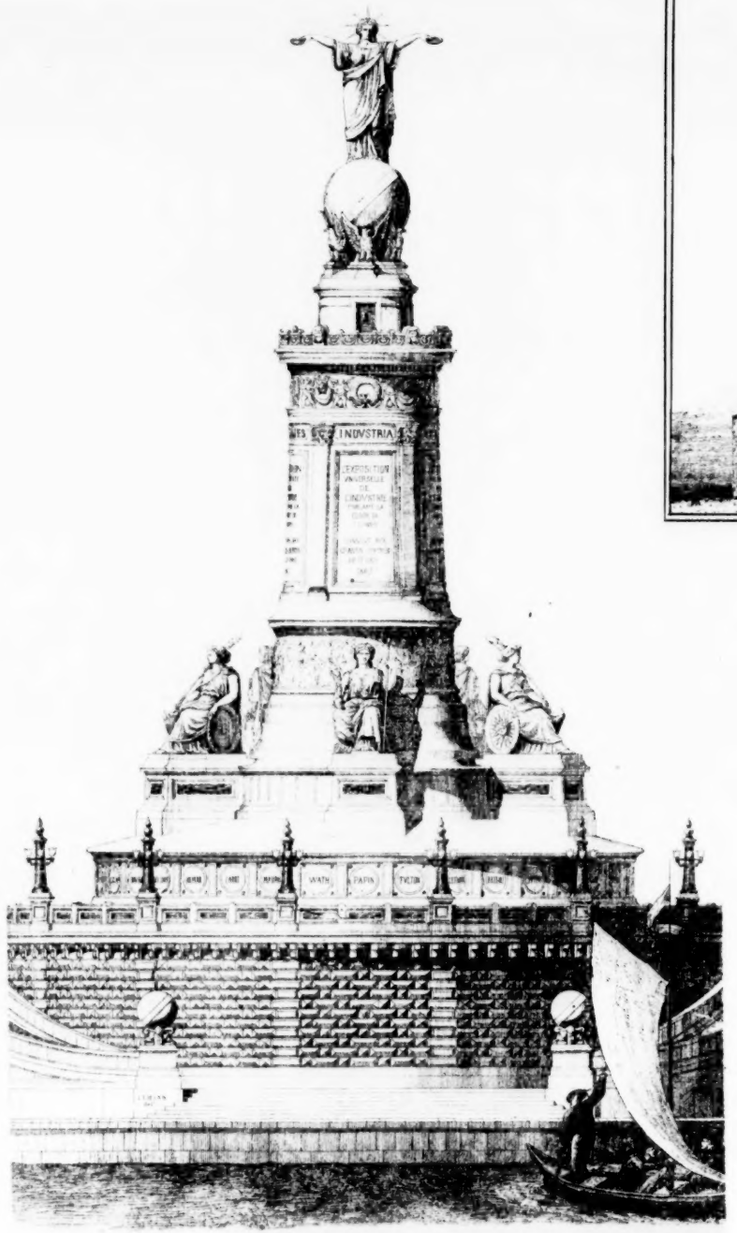
STONES TO COMMEMORATE THE BATTLES AROUND PARIS.

A MONUMENT TO LAMARTINE

M. DEPERTHES, ARCHT. AND M. ROUBAUD, SCULPTOR

M. HOYEAU.

M. DEPERTHES, ARCHT. AND M. ROUBAUD, SCULPTOR.

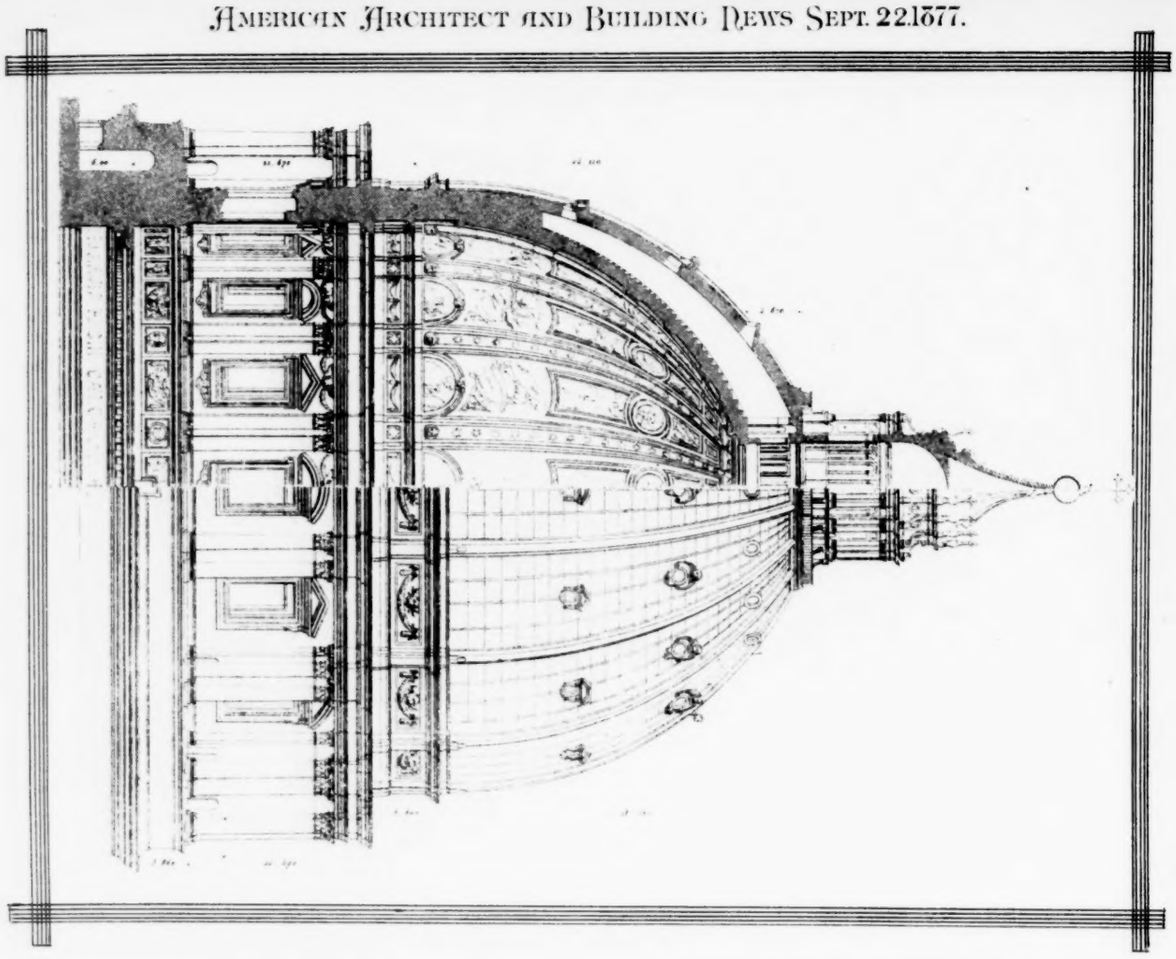


A MONUMENT TO COMMEMORATE A UNIVERSAL EXHIBITION

M. ULMANN.

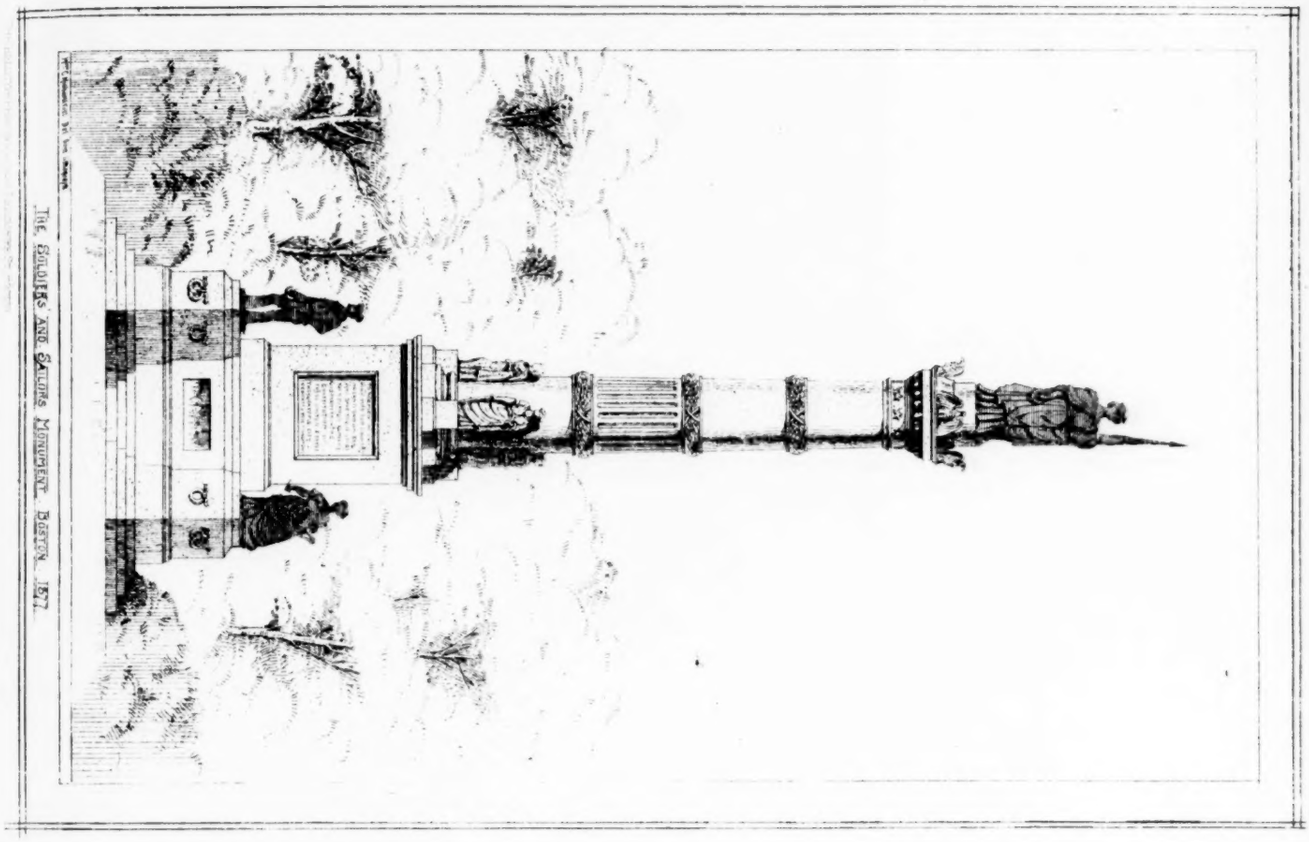
A MONUMENT TO COMMEMORATE THE VICTORY OF CALLAO

M. HENARD ARCHT. AND M. GERARD SCULPTOR.

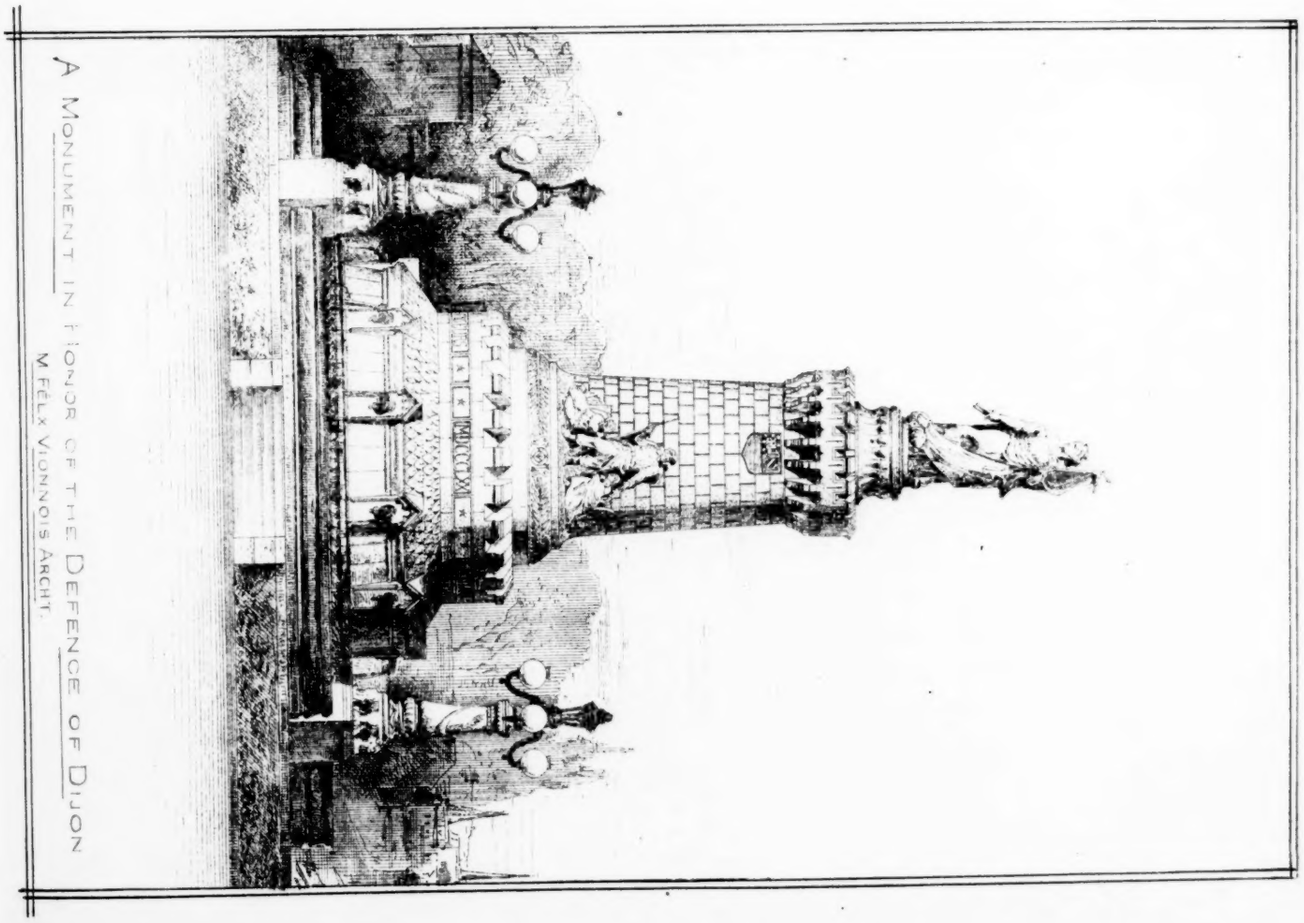


THE DOME OF ST. PETER'S.

RESIDENCE OF R.P.CATTRALL. CASE AVENUE. — F.S. BARNUM. ARCHITECT. CLEVELAND. O.



THE SOLDIERS AND SAILORS MONUMENT, BOSTON, 1877.



A MONUMENT IN HONOR OF THE DEFENCE OF DIJON

M FÉLIX VIONNOIS ARCHT.

of Jupiter should be placed about the middle of the fourth century, a hundred years after the foundation of Selinus, and a hundred and fifty years before its ruin. The more modern façade must be slightly later than the Medic wars. The beauty of the materials employed for this temple strike one with amazement, and the *débris* themselves are so large that one asks one's self how it was possible to handle such blocks. But after all, it is only a question of arms and money; besides, in matters of art, size is an affair of only secondary importance. There are blocks which measure nearly eighteen feet in height by nine or ten feet in thickness. The quarries are upon the other side of the river Selinus, so that it was necessary to cross the little valley which separates the two halves of the city and the Selinus itself. One still sees drums of columns which have for twenty-four centuries remained upon the road from the quarries where they were abandoned by the teamsters. — *M. Beulé in the Revue Générale d'Architecture.*

THE ILLUSTRATIONS.

DESIGN FOR A MONUMENT TO LAMARTINE AT MACON, FRANCE. MM. DEPERTHES, ARCHITECT, AND ROUBAUD, SCULPTOR.

THIS design took the second prize.

A MONUMENT TO MUSIC. M. HOYEAU.

This monument was designed by a student at the *Ecole des Beaux-Arts*, in one of the ordinary bi-monthly competitions.

A MONUMENT INTENDED TO COMMEMORATE A UNIVERSAL EXHIBITION. M. ULMANN.

This design received the first prize in the yearly competition known as the *Concours d'Achille Leclerc*.

A MONUMENT TO COMMEMORATE THE VICTORY OF CALLAO, PERU. M. J. HÉNARD, ARCHITECT, AND M. N. J. GIRARD, SCULPTOR.

A MONUMENT IN HONOR OF THE DEFENCE OF DIJON. M. FÉLIX VIONNOIS.

This design received the first prize in open competition. It, as well as the four preceding monuments, is taken from the publication of the students of the *Ecole des Beaux-Arts*, known as the *Croquis d'Architecture*.

SOLDIERS' AND SAILORS' MONUMENT, BOSTON, MASS. MR. M. MILMORE, SCULPTOR.

See Summary.

THE DOME OF ST. PETER'S CATHEDRAL, ROME.

See leading article.

RESIDENCE OF MR. R. P. CATTRALL, CLEVELAND, O. MR. F. S. BARNUM, ARCHITECT.

DECIMALIZING BRITISH MEASURES.

THE arguments in favor of introducing the metric system are sometimes met by a proposition to reform our present weights and measures, instead of casting them all aside. Perhaps the best presentation of this plan yet published is at the close of an interesting lecture by the late Sir J. F. W. Herschel, the eminent astronomer, on "The Yard, the Pendulum, and the Metre."[1]

The lecturer is chiefly occupied with the subject of a natural basis for a standard of weights and measures. Referring with admiration to the degree of accuracy attained in the meridian survey upon which the metric system was based, he says, "Adopted as it is, over a large portion of Europe, were the question an open one what standard a new nation, unprovided with one, unfettered by usages of any sort, and in the absence of any knowledge of the existence of the British yard, should select, there could be no hesitation as to its adoption," etc.; but he is confronted with "the fact that England is beyond all question the nation whose commercial relations, both internal and external, are the greatest in the world; and that the British system of measures is received and used, not only throughout the whole British Empire (for the Indian 'Hath,' or revenue standard, is defined by law to be 18 British imperial inches), but throughout the whole North American continent; and (so far as the measure of length is concerned) also throughout the Russian Empire; the standard unit of which, the sagene, is declared by an imperial ukase to contain *exactly* seven British imperial feet, and the archine and vershock precise fractions of the sagene. Taking commerce, population, and area of soil, then, into account, there would seem to be far better reason for our continental neighbors to conform to *our* lineal unit, could it advance to the same, or a better *a priori* claim, than for the move to come from our side."

This lecture is dated in the fall of 1863. The outlook at the present time is different. Since then the metric system has been introduced in Germany, Austria, Roumania, and one or more South American countries. It has been adopted by laws which will take final effect hereafter in Sweden, and (according to the 9th report of the Warden of the Standards, British Parliamentary documents, 1875) in Norway. One of the latest reference books on this subject[1] states that in 1870 the use of the metric system was made obligatory by law in Turkey; but probably the effect on commercial transactions is not yet very great. It is worth noticing, by the way, that the countries here named constitute the entire European frontier of Russia.

Please observe too, that Sweden already had a complete decimal system, adopted in 1858, starting from her foot and pound. The metric system has been legalized in the United States (1866) and Great Britain (1864).

"An Act 'to provide for the ultimate adoption of an uniform system of weights and measures of capacity throughout British India,' was passed in October, 1875. The *ser* is adopted under the Act as the primary standard, or unit of weight, and is a weight of metal, in the possession of the Government, equal when weighed in a vacuum to one kilogramme. The unit of capacity is the volume of one *ser* of water at its maximum density, equivalent to the litre. Other weights and measures are to be multiples or submultiples of the *ser* and of the volume of one *ser* of water." This is taken from p. 180 of "Rules, Tables, and Data," the new publication, 1877, by the well-known English engineer, D. K. Clark. As for Russia, Consul-General Bodisco is quoted as stating that "the Imperial Commission sent to Paris to inquire, reported in favor of the introduction of the metric system into Russia, and the government has the subject now under advisement." The only common point between the Russian weights and measures and those of any other country is the connection above pointed out with the British foot, which was introduced by Peter the Great after his experience in English dockyards. 16 vershocks make one archine; 3 archines make one sagene. So the vershock equals $\frac{7}{4\,8}$ feet, or $1\frac{3}{4}$ British inches; the archine, $2\frac{1}{4}$ feet, or 28 inches; the sagene, 7 feet. This amounts to about as much in the way of a simple relation as the connection of our so-called "surveyor's measure" with long measure. Suppose that Gunter's chain had never been used in England, and that the Russians instead of their sagenes and vershocks, had a chain equal to 4 British rods, and divided into 100 links, each equal to $7\frac{9\,2}{1\,0\,0}$ British inches, how far would that go toward inducing them to adopt the whole British metrology, now that the rest of Europe is irrevocably committed to the metric system?

Sir John Herschel's exhaustive discussion leads him to the conclusion that the earth's polar axis is the best natural basis for a system of weights and measures. He proposes to make minute changes, which for commercial purposes are inconsiderable, in the foot, the ounce avoirdupois, and the imperial half-pint, so that the foot shall bear a simple ratio to the earth's axis, and that the half-pint shall be $\frac{1}{1\,0\,0\,0}$ of a cubic foot, and shall hold ten ounces of water. This scheme is not so well adapted for the United States as for England; because neither our dry pint nor our liquid pint has any thing to do with the British imperial measure. All the capacity measures in the United States would have to be altered in order to adopt it.

Upon this admirable basis, it may be proposed to remodel our medley of weights and measures, and make a system either wholly or partly decimal. If partly, then by so much as we fail of being completely decimal, by that amount we lose the benefits of an entirely decimal system like the metric. Sir John Herschel evidently does not attach superlative importance to decimal subdivision. Besides dividing the foot into ten parts and making the cube of one-tenth hold an ounce of water, he would also retain the present division into twelve parts, and the earth's polar diameter would be expressed as 500,000,000 inches (and could not be precisely expressed in feet and tenths). This twofold subdivision of the standard unit, though it is sometimes spoken of as if it were an additional convenience, is really the source of endless annoyance. The reader who has ever tried to work in tenths from an architect's plan figured in inches, or has labored to instil into the mind of a stupid earthwork-contractor what "Cut 1. 9" means on a grade stake, can appreciate the disadvantage referred to. There is increased liability to error in reading figures on plans, if two incongruous methods of subdividing are used indifferently.

If on the other hand the remodelling should be purely decimal, there would be nothing left of the existing units in this country, except the foot and the avoirdupois ounce. If we are going to the extent of throwing aside every thing else, might we not as well drop them too, and take up the metric system? A minor consideration is worth mentioning which relates to the practical conduct of the change. When the metric units are used, the English will naturally be adopted; there will be no tendency for the foot to cling to the metre. But to abolish the yard while the foot is retained, to use the ounce constantly and abandon the pound, would be completely accomplished only after the lapse of a long time. The main question is: If we are bound to have

[1] Familiar Lectures on Scientific Subjects. Alex. Strahar. London and New York, 1866. The lecture here cited has been reprinted in "The Metric System," etc., by Charles Davies: A. S. Barnes & Co., New York and Chicago, 1871.

[1] Monnaies, Poids, Mesures, et Usages Commerciaux de tous les états du monde. Paris: Hachette et Cie., also Harre: A. Lemale, Aîné. 1875.

a radical reform in metrology, at all events, shall we go far enough to bring ourselves into harmony with the rest of Christendom, and so oblige Great Britain to follow suit; or shall we preserve two or three of our multifarious units in the hope of maintaining a few years longer our uniformity with Great Britain's insular system, and with the possibility that Russia may adhere to the British foot?

England adopted the Gregorian calendar in 1752, which the Catholic countries of Europe had generally adopted about 1582. Russia has not adopted it yet, so that what we call the 15th of September is in Russia the 3d of September. The old Roman figures (now happily supplanted by the Arabic decimal notation) "lingered longer in England than in any other part of the European world, having found an asylum in the dark and dull regions of Exchequer." So says Sir John Bowring on p. 26 of his Decimal System (1851). In a subsequent chapter giving a history of the practice of the Exchequer, he says: "A tally was a stick (generally of hazel) prepared by an officer called the Tally-Cutter, or Cutter of the Tallies; on the tally, notches were cut, indicating the sum in the Teller's Bill, a large notch for M (or £1,000), a smaller notch for C (or £100), a smaller still for X (or £10), and so on for pounds, shillings, and pence" (p. 118, and on pp. 124, 125). "It is, indeed, scarcely credible, that the perplexing and entangled manner of keeping accounts by the Roman numerals, in the same barbarous style which was practised before the Norman Conquest, was maintained at the Exchequer almost down to the present day; and the introduction of the English language and the Arabic numerals was successfully resisted by no less a personage than Lord Granville, on the ground that if the barbarous usages of our ancestors were reformed, it would be difficult to understand the accounts, and the records of departed time." . . . "*Tallies* continued to be used down to the year 1782. It was only in the year 1831 that the Committee on Public Accounts, of which I was the Secretary, recommended the utter and immediate abolition of the ancient system, and the adoption of the Arabic numerals and the English language. It was in consequence of this change that, in the year 1834, the tallies were ordered to be burnt, a conflagration which led to the destruction of both Houses of Parliament — the Exchequer in which the tallies were kept having formed a part of the ancient edifice of St. Stephen's."

Must the United States travel in such ultra conservative company? — *Engineering News.*

CORRESPONDENCE.

THE PENNSYLVANIA INSANE ASYLUM. — NEW BUILDINGS FOR THE GIRARD ESTATE, AND FOR GIRARD COLLEGE.

PHILADELPHIA, Sept. 13, 1877.

As was remarked a few weeks ago, the Pennsylvania Lunatic Hospital bids fair to be another lost opportunity so far as concerns its architectural qualities. Literally, too many doctors in the commission. This body knows all about what it requires: it does not want that species of talent and experience which was lately referred to in the Summary; that sort of thing very rarely *is* wanted, much as it is needed, in Philadelphia or its vicinity, where, as in this case, an architect is very frequently employed, as it were to guess a conundrum, and from the time of his employment has to wage a constant warfare with the prejudices of his employers; for the conservative Quaker element, although no more aggressive than formerly, is far from dead.

What impression does the Board of Trustees of the American Institute of Architects hope to make by its action of the 16th of August? So far from appreciating the Institute as being any thing of a public benefit, one hears it even now referred to by intelligent citizens as a trades-union.

The fact is, any thing in the nature of art in a building is regarded as a non-essential; and although there is a vague notion in the community that an architect adds a certain something to the work which, as is generally remarked, makes it look odd, yet it is oftener considered that he adds to it not a little unnecessary expense. This is why in many important works a builder is employed to get up his own drawings, it being a popular notion that they are more practical, and, what seems to be of more importance, they are not charged for.

The commission seems inclined to regard the action of the Board of Trustees of the Institute of Architects somewhat as the railroad companies did the orders of Chief Engineer Arthur during the late strike, and to congratulate itself that, notwithstanding the resolution, "a number of very handsome plans have come in from the Philadelphia architects." Among these are Messrs. Collins & Audenreith, Furness, Hutton & Ord, Sloane, and Wilson & Thorn. A larger number have been submitted from other places, which swell the list of competitors to some twenty-five in all.

It is probable that a room will be taken in the Baptist Publication Society's building on Chestnut Street, between Broad and Fifteenth Streets, where these plans will be placed on public exhibition. The movements of the commission, it must be confessed, are somewhat crab-fashion, since, after having had numerous unsuccessful meetings to select a site for the institution, now that the plans are sent in, another effort to settle this rather important point was made on Wednesday (12th) afternoon; and after much discussion and some thirty ballots the choice was made of what is known as the Hitner farm, about two miles north of Norristown, in Montgomery County, the price being about $200 per acre.

The Girard Trust is about to build two buildings for brokers' offices on its property on Third Street, south of the old Girard Bank, extending through to Harmony court and adjoining the building which was built last year for the Board of Brokers. On Wednesday the contract was awarded to Louis Havens, whose bid was the lowest of the nine offering. The work is to be completed by the first of the coming year. Mr. Windrim, the architect of the Trust, has in progress a new chapel at the Girard College capable of accommodating 2,000 boys: this is nearly ready for plastering. The style of this building, — what is called Gothic hereabouts, — with its high-pitched roof, is in very striking contrast with the comparatively pure Corinthian of the College building itself (from which it stands about 200 yards to the westward), built from Mr. T. U. Walter's designs about forty years ago. There is something which strikes one as very strange in so prominent an ecclesiastical edifice rising within this enclosure, in view of the well-known fact that the will of Stephen Girard contained a very stringent provision that no clergyman of any denomination whatever should as such ever be admitted within the enclosure. Besides the chapel, eight new dwellings are being built to afford accommodations for 320 additional pupils, the present capacity being about 600. Two of these buildings will be ready for occupancy next month, and the others before the end of the year.

Building permits were issued during August for 466 new buildings, and 142 alterations and additions. Among the new buildings are 420 dwellings, 17 stores, 1 bank, 2 factories, and 3 schoolhouses.

LIGHTING BY ELECTRICITY.

PHILADELPHIA.

In the *Journal of the Franklin Institute* for September will be found a letter from M. A. Sartiaux, Assistant Engineer of the Northern Railway of France, addressed to the Secretary of the Institute, from which it appears that at the merchandise station of this railway, at La Chapelle, Paris, they have now in use a system of electric lighting.

For this purpose three magneto-electric machines are employed, but they have made preparation for five machines in the construction of the building and the power of engine provided.

The machines themselves are "Gramme" of the smaller size, which the circular of the makers describes as requiring 1¾ horse-power to run at 850 revolutions per minute, at which speed they will produce a light equal to that proceeding from 150 gas-burners burning five cubic feet of 16-candle (the stated quality at Philadelphia) gas per hour. The makers say that this quantity of light will be doubled by careful adjustment of the carbon points, where the light is evolved, and rate the power to be expended as the light evolved, thus calling for 3½ horse-power for the same machine when producing the maximum of light. M. Sartiaux estimates the power at from two-horse power to 2.9 horse-power, basing his computation of cost of light on two horse-power.

The lamps, as the machinery for holding and regulating the feed of the carbon points as they wear away are called, are those of M. Serrin. The carbons are square pencils made from the substance deposited in the retorts used in gas making, ⅜ of an inch square, 8½ inches long for the positive pole and 4¼ inches for the negative pole, which burn four hours.

The lamps are placed in three-cornered lanterns, which have solid bottoms, and have a tin top when out of doors, but are open at the top in the halls. The sides are of double glass, $\frac{4}{10}$ of an inch apart, to avoid breakage from cool currents of air. The dimensions of the lantern are 18 to 20 inches on the sides by 3 feet 4 inches to 3 feet 8 inches high. The sides are clouded by zinc white to such height as will prevent the voltaic arch being seen when the lantern is in its place. A large illuminated body is thus procured, at the evident expenditure of light however, sufficiently reduced in brilliancy to be endured by the eye without injury. The rays emerging above the obscured band on the lantern are reflected, within the hall, by the whitened walls and ceiling, which serve as diffusing reflectors; but out of doors, the tin top of the lantern serves rather as a cover than as a reflector.

In the halls, a single lantern placed in the middle, at the height of 16½ feet, gives a general light, without troublesome shadows, sufficient for the recognition and handling of packages for a radius of 110 to 125 feet. Out of doors, a lantern placed at the height of 20 to 23 feet admits the management of the cars within a radius of 200 to 270 feet.

M. Sartiaux estimates for these three machines and lanterns, running ten hours: —

Motive power	$1.37
Mechanic	1.00
Carbons	.90
Ten per cent of cost per year, per day	1.26
Oil, repairs, etc.	1.00
Total	$4.73

These figures should be altered to apply to American conditions, and the following will give a liberal estimate.

For three Gramme magneto-electric machines, with Serrin lamps running ten hours per day (or night):—

Six horse-power, at 40 cents per day of ten hours[1]	$2.40
Mechanic in attendance ten hours . . .	$1.75
Carbons	1.35
Twenty per cent of cost of electric machinery [2]	2.25
Total for ten hours	$7.75

Comparing this with light from gas-burners in Philadelphia, and accepting the evolution of light from each electric lamp as equal to 150 gas-burners of five cubic feet per hour, burning 16-candle gas, we have, —

Three lamps × 150 gas-burners × 5 feet × 10 hours,
= 22,500 feet of gas at $2.15 per thousand . $47.93

This estimate makes electric lighting to cost, in Philadelphia, about one-sixth that of gas lighting wherever the quantity of light required is so large as to make the electric system available.

It may be admitted, however, that in lighting by gas of most public places or buildings, the gas-lights themselves may be arranged, and generally are arranged, so that they are not more than ten or twelve feet on the average removed from those persons who require or use the light, while the electric system will demand about twice this average distance. As the quantity of light supplied will vary as the square of the distance from the objects lighted to the source of light, it follows that four times as much light must be provided by this electrical agency as is required in ordinary arrangements for gas lighting. (The value of the reflected light from the electric lamps may be accepted to balance the necessary obscuration of direct rays emanating from the voltaic arch.) This assumption of allowance will yet preserve the superiority of electric lighting as half as expensive as gas lighting.

Beside the question of economy, questions as to relative healthfulness, comfort, or safety from fire, may be considered.

As regards the first of these, with electric lighting the production of irrespirable gases of combustion — the vitiation of air of a room — almost entirely ceases. The products of combustion which accompany electric lighting are almost inappreciable. The three lamps referred to burn or consume (for some is not burned) 9½ inches of carbon pencils, ⅜ inch square, per hour. The weight of carbon is possibly an ounce and a half; and the resulting quantity of carbonic acid gas is, if the carbon is really burned, 2½ cubic feet. While for comparison, taking the gas lighting as four times as efficient in practice as the electric, so that 5,625 cubic feet of gas shall be assumed to give as much effective light as the three electric lamps, we have a consumption of 562½ cubic feet each hour; a volume of gas equal to 17.9 pounds, which will produce no less than 227 cubic feet of carbonic acid gas, and about 87 pounds of vapor of water. The quantity of oxygen taken from the air for burning this gas is 95.5 pounds, while the air needed for complete combustion — that is, twice as much as contains the oxygen really burned up — is 11,600 cubic feet per hour.

The comfort of a room is materially affected by the heat emanating from lights. With electric lighting it may not be proper to take the heat of combustion of the carbon points as the sole heat evolved; for this, when computed, amounts to only the equivalent to heating 1,200 pounds of water one degree each hour, or 20 units per minute. But there is a more accurate way of regarding the heat of electric lights. Whatever may be the source of power which drives the magneto-electric machines, or however wastefully or economically the prime mover may have been used, the quantity of heat produced by electricity or otherwise *from* the machines cannot exceed the theoretic equivalent of heat. One pound of water heated one degree Fahrenheit represents 772 pounds lifted one foot in height. Having 6 horse-power as the power needed to drive the three Gramme machines, we transform the horse-power into pounds lifted one foot high each minute, by multiplying by 33,000, giving 198,000 foot-pounds, and dividing by 772 foot-pounds, it follows that 256¼ pounds of water heated one degree represent all the heat *possible to proceed* from the motive power imparted. Much of this heat may be lost in friction, or in the heating up of the machines themselves; but for this estimate let us accept this quantity of heat as given possibly from electric lamps each minute, in lieu of the 20 units which proceed from burning of carbon points. The gas consumption has been accepted as 562½ cubic feet per hour, — 9.375 cubic feet per minute; which in burning will give out 10.125 units of heat, to be dispersed by radiation, or to pass off with the products of combustion. These figures show the relative heating effects of electric and gas lighting, with every assumption in favor of the latter (and particularly the assumption that only one-fourth as much light is to be supplied by gas-lighting), to bear the ratio of *one to forty*. In these figures also, we have taken the two horse-power per machine given by M. Sartiaux in his estimate, while the Gramme machine-makers assert that 1⅔ horse-power suffices; we incline to accept which assertion as the result of actual trials. Accepting this value, and supposing a case where the gas-lights are placed above the ceiling of a room or hall, so that electric lighting would apply on an equality of distance from the audience, the heat proceeding from electric lamps would compare with that from gas-lights, as *one to one hundred and ninety-two*.

The question of relative safety from fire of the two systems, in theatres especially, is too important not to merit remark; but after bringing it before the reader, no comment is needful. The dangers of leaky gas-pipes and fixtures, disastrous explosions, the feeding of flames by gas when accident occurs, all disappear before the harmless wires which convey the electric current to sources for illumination.

With all these advantages there remains yet another. The electric light is the nearest possible to the natural one of the sun. With proper disposition of lamps, the room or space is filled with light, so that the ceiling, walls, floor, or the objects within a room become, as they do in daylight, sources for reflected light, diffused and distributed without glare or fatigue to the eye. Colors have their natural values and tints. The gratification of the most delicate sense is not the least of the promises in the future perfection and application of electric lighting.

ROBERT BRIGGS, C.E.

[1] The above price is $125 per year, per horse-power, and is a full profit rate for power supplied in small quantities.

[2] This percentage is to cover interest, repairs, oil, etc.

CIRCULATION OF HOT WATER IN BUILDINGS.

MR. F. G. BRAMWELL, on the closing day of the meeting of the British Association, read a paper in the mechanical section on a new mode of circulating hot water throughout very large buildings, and upon a new mode of softening water, as carried out at the new lunatic asylum (the third) for the county of Middlesex, situated on Banstead Downs, in Surrey. The author stated that this asylum extended over many acres, comprising as it did numerous separate "blocks," as they are technically called, for the reception of the patients, for infirmaries, the administration department, and other purposes. In order to obtain economy and simplicity in management, it was desirable that the whole of this extensive acreage of buildings should be heated and supplied with hot water for baths and other purposes from one source of heat. It was well known that in a single house, or even in a single large building, the circulation of hot water could be automatically maintained by the mere difference in gravity between the hotter ascending column of water and the cooler and heavier descending column. The power thus obtained, however, was wholly inadequate to cope with the thousands of yards — miles indeed — of pipes at Banstead. To overcome the difficulty, and to enable the building to be warmed and supplied from a single source of heat, the author had devised the plan of placing in the engine-house a centrifugal pump, which forced the water along the outgoing main, and exhausted it along the return main. These mains were conveyed side by side in trenches throughout the whole enormous establishment. They were not connected at their ends, but at each block of buildings a pipe, controlled by a valve, led the hot water into that block, and supplied the whole of the heating coils therein, the outlet pipe from this system of coils being united to the return main. Thus the water circulates through each block with the velocity due to the difference of pressure between the outgoing and the return mains, instead of circulating with the feeble velocity arising from a mere difference in temperature. It would be seen that there was practically no waste of fuel in the employment of steam to work the centrifugal engine, because the waste steam of the engine was used to aid in heating the water. This system of forced circulation would render it possible to lay on to groups of buildings, such as streets of workmen's dwellings, a supply of hot water for heating their dwellings, and for washing purposes.

The water was pure spring water obtained from a deep well in the chalk, of about seventeen degrees of hardness, and therefore a perfectly fit water for dietetic purposes in its natural condition; but on being boiled it deposited the carbonate of lime in the boilers and pipes through which it was conveyed, and thus the author of the paper was led to urge upon the magistrates the necessity, if they wished to preserve their boilers and heating apparatus from being coated with carbonate of lime, of softening the water by Dr. Clark's process. This process is known to many as an extremely beautiful and simple one. The hardness of chalk waters depends principally upon their containing a certain amount of bicarbonate of lime in solution. Lime is soluble in water readily, bicarbonate of lime is soluble in water readily; but carbonate of lime is insoluble. If, therefore, the bicarbonate could be converted into a carbonate, it would be deposited from the water, which would thus become soft. This conversion of the bicarbonate into a carbonate is effected in Clark's process by mixing with the natural water containing the bicarbonate a small portion, one-tenth to an eighth, of water in which lime has been dissolved. On these waters being united, they instantly become milky; and after being allowed to stand for some hours the water again becomes bright, the carbonate of lime having fallen to the bottom. This operation, however, it will be seen, requires very large depositing tanks, and a considerable expense, therefore, in plant; but Mr. Porter has recently invented an improvement upon Clark's process, which appears to promise excellent results, and has, after experiment, been adopted at Banstead. The principle

and mode of treatment, as far as the chemistry is concerned, are precisely the same as Dr. Clark's; but instead of waiting the slow process of deposition to separate the carbonate of lime from the water, the mixed water is passed through filter-presses of a peculiar construction, wherein the carbonate of lime itself is made the filtering medium for itself; and in this manner, within a quarter of an hour of the mixture having been made, perfectly pure and soft water issued forth. There are four presses at Banstead, and these are sufficient to filter an average hourly quantity of 60,000 gallons of the purest and softest water, which is pumped into the tank on a tower eighty feet high. The tank contains 240,000 gallons. Six-inch pipes, so as to avoid friction, are laid all over the asylum, and internal and external hydrants are fitted thereto. Moreover, if a fire continued so long that the tank was exhausted, the engines which draw the water from the well and raise it into the tank can be caused to act direct as fire-engines. The whole of the work, except the Porter-Clark process, has been carried out by Messrs. Eastons and Anderson; and the author of the paper was the engineer to whom the Middlesex magistrates confided the design and superintendence of the work. — *The Architect.*

NOTES AND CLIPPINGS.

THE ANNUAL CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS. — The Eleventh Annual Convention of the American Institute of Architects will be held in Boston, commencing on Wednesday the 17th of October next. The proceedings will occupy three days. It is proposed to hold morning sessions on Wednesday, Thursday, and Friday, and evening sessions on Wednesday and Thursday. The afternoons will be devoted to visiting the principal buildings erected in the city and the immediate neighborhood since the Institute last held its Convention in Boston, especially that part of the city rebuilt since the fire of 1872.

A SOLDIERS' MONUMENT. — On the 12th inst. a soldiers' monument was dedicated at the National Home in Dayton, O.; it consists of a massive base and towering shaft surmounted by the statue of a private soldier. The base is of limestone, 11 by 6 feet; the second block is of White Mountain marble, 5 by 3 feet; the shaft is of marble 43 feet high, and comprises twenty blocks; the statue is 19 feet high, and represents a soldier on guard, and is said to be admirably sculptured. The work was designed by the veterans, and executed by Messrs. Struther of Philadelphia. The statue faces east. The inscriptions on the block are: on the east, "Erected by the officers and members of the National Home;" on the north, "These were honorable men in their generation. — *Eccles.* xliv. 7;" west, "MDCCCLXXIII;" south, "To our fallen comrades." The statue was cut from a solid block, and weighs 5,000 pounds. The cost was $2,800.

THE ADAMS CLAIM. — At the last session of the Massachusetts Legislature a bill was passed providing for the submission of the claim of Edwin Adams against the commissioners for the erection of the new insane asylum at Danvers, for extra work, and detention and loss by delay, to a board of arbitrators consisting of Francis E. Parker, L. Miles Standish, and Benjamin F. Prescott.

The claim, including about $3,000 balance due on the contract and interest, amounted to about $52,000. Previous to the hearing at the Legislature, the consulting architect, Hon. N. J. Bradlee, offered to pay Mr. Adams about $23,000 with interest for the extra work, in addition to the amount due on the contract. Mr. Adams refused to accept the offer, and preferred to go before a board of arbitrators. The Board commenced their consideration of the bill the 18th of May, and the arguments were made on Aug. 11 and 13; the commissioners being represented by ex-Gov. Gaston, and Mr. Adams by Solomon Lincoln, jun. The award was recently made and returned to the Supreme Court, and was opened on Tuesday. The arbitrators find that the Commonwealth should pay $27,436.85 in full satisfaction and discharge of all claims and demands of said Adams against the Commonwealth, in respect to the matters contained in the bill, except the items 389 to 421 inclusive, which relate, according to the bill, to "fitting on cobstone," but which Mr. Adams asks to amend by inserting in place of the above words the words "on underpinning and first belt." In case the Court rules that the amendment may be made, the Board awards $482.31, including interest, for those items. The Board further determine that the Commonwealth shall pay the said Adams his costs of court, costs of witnesses, and other taxable costs incidental to the reference, including the sum of $3,300, which they charge for their fees. Deducting the balance due on contract, $3,000, and interest, about $2,000, the award in principal amounts to about $22,500, a little less than Mr. Bradlee's offer, and $24,000 less than the claim. The report is to be passed upon by the Court, and may be approved or recommitted.

FRESH-WATER DOCK FOR IRON-CLAD VESSELS. — The Board of Engineers have begun the examination of Elizabeth River, near Norfolk, with a view to constructing there a fresh water basin for the storage of iron-clads. It was thought last Spring that a good harbor and beach could be made for them at Port Royal, but upon thorough investigation that place was found to be unsuitable; and the action of salt water upon iron-clads being so injurious, the Secretary has decided to take prompt action for their preservation. League Island is not available on account of ice in winter.

A NATURAL PHENOMENON. — There is said to be a well in Wise County, Texas, one hundred and ten feet deep, which ordinarily has an abundant supply of water at all seasons of the year, but from which, when the wind blows twelve hours from the north, no water can be drawn.

STATUE OF ANDREW JOHNSON. — A colossal marble statue of Andrew Johnson, which is to be erected near his old home in Tennessee, is now being cut in Philadelphia.

EXPLOSION IN A CHURCH. — There was a curious explosion in the First Presbyterian Church at Plattsburg, N.Y., last Thursday, says the New York *Tribune*, the windows being blown out, the furnaces shattered, and the ceiling ruined. Those who entered the main audience-room found it filled with gas, the carpets and cushions blazing, several of the memorial windows ruined, three small arched windows over the organ completely shattered, and the heavy outside front door blown out into the street. The statement of sexton Prindle is that he spent a portion of the day in the main room, sprinkling benzine upon the cushions and carpets, according to directions given to him, to kill the moths with which the carpets and upholstery were infested. He thinks that about two-thirds of a barrel of benzine was used in this manner. After finishing his work up stairs he went down into the lecture-room and made his preparations to start a fire in the furnace in the south-west corner. He cut kindlings and lighted a match, when a shock came which threw him fifteen feet and rendered him insensible.

YALE SCHOOL OF FINE ARTS. — The late Mrs. Caroline M. Street, according to the terms of her will, which has been admitted to probate in New Haven, bequeathes $50,000 to Yale College to create a fund for establishing professorships in the Yale School of Fine Arts. The professor of painting is to be also "Director of the School of Fine Arts." He must be a practical artist, of acknowledged ability in the profession, a member of the New York Academy, and of the old approved school. The will selects John F. Weir as the incumbent, at a salary of $3,000 per annum, and the professorship is to be called the "William Leffingwell Professorship." The interest of the $50,000, after deducting the salary of the professor of painting, shall be used to commence a foundation of a professorship of drawing and kindred duties, to be called the "Street Professorship." Twenty-five thousand dollars is given in a codicil to the will, the interest of which is to pay a salary of $2,500 per annum to the professor of drawing, and to the purposes of art. The Yale School of Fine Arts was founded about fourteen years ago by the late Augustus Street, and a fine building was erected for its accommodation according to the terms of his will. His widow has now handsomely endowed the institution, and made it independent of the college.

THE GUARANTEE TRUST CO.'S BUILDING, PHILADELPHIA. — This structure, built from plans prepared by Messrs. Furness and Hewitt, is a modification of the Venetian style; and its unique appearance, and the strong contrast it presents to the buildings in the vicinity, make it especially prominent. The exterior is of the finest pressed brick, laid in black cement, ornamented with light Ohio stone, polished Scotch granite, and encaustic tiles in bright colors. The prominent features of the front elevation are two square towers, one at each corner, which are seventy feet high, crested with carved stone and with rods of iron and slate. The treasury, which is entered from the body of the building through iron doors, is a room 28½ feet wide, 49′ long, and 40′ high, which contains the great fire and burglar proof vaults of the company. These vaults, six in number, are arranged in three stories, two on each story, and are reached by galleries and iron stairways. They are constructed of interior walls of hardened iron and steel plates 2½ inches thick on all sides, top and bottom, and 3½ inches thick at all corners, having outer and inner doors of solid welded iron and hardened steel plates, clear of bolt work. The iron and steel work of the vaults is enclosed on all sides by massive walls of dressed granite blocks, each 6′ to 8′ long, 2′ high and 2′ thick, the front being 4 inches thicker. All these are laid in cement, and securely clamped and dovetailed together. The roof of the top range of vaults is two feet thick, and is constructed of nine immense blocks of granite weighing variously from eight to thirteen tons. Between the granite and the steel walls a space of three inches is filled with hydraulic cement, which has now become as hard as the granite itself, and which renders the vaults perfectly dry. The foundations are of solid granite, and extend twenty feet below the level of Chestnut Street, the entire excavations being filled in with stones of great size and weight, which were laid by machinery in cement. The lower stone courses of this foundation are laid below the water-level, to make it more impossible to undermine the vaults. Each of the vaults is 18′ deep, 10′ wide, and 7½′ to 8′ high. On the sides are arranged the safes, which enclose long tin boxes suited for the reception of documents of any kind. These safes — of which there are 2,000, and space for 6,000 — have each a key which is fitted for no other lock in the building. The walls of these safes are entirely distinct and separate from the walls of the main building. There is, in fact, a space wide enough to permit a person to walk entirely around the vaults. Nor does the roof of the vaults reach the roof of the building by about twelve feet. The doors leading to the vaults are marvels of ingenuity; even the keyhole, which has proved such a handy receptacle for gunpowder, is conspicuous by its absence. These doors can be opened but by two persons, and neither of these persons sleeps in the building. There are in another department of the treasury-room storage vaults, where are deposited plate, bullion, and valuables of too bulky a character to be placed in the vaults.

THE SHELTER OF A GOOD NAME. — A gang of sharpers recently set up business in New London, Conn., under the name of Sutton & Co., architects. Gambling was their principal business, hence Mayor Waller ordered them to leave town.

TO FASTEN LETTERS ON GLASS. — To fasten metal letters on glass, use a cement made of fifteen parts of copal varnish, five parts of drying oil, three parts of turpentine, two parts of oil of turpentine, five parts of liquefied marine glue; melt these together in a water bath, and then add ten parts of dry slacked lime.